

Public Utilities, Energy, and Technology Interim Committee

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UAMPS

Utah Associated Municipal Power Systems



WHY NUCLEAR?

- Replacement for retiring baseload resources
- Physical hedge against reliance on uncertain future market purchases
- Zero carbon emitting
 - Regulatory benefits
 - Customer sustainability and rate stabilization benefits
- Flexible baseload resource that can interplay with a western market with increasing levels of renewable penetration

CFPP TEAM

- UAMPS
- NuScale Power/Fluor
- Energy Northwest
- Department of Energy
- Nuclear Regulatory Commission
- U.S. Congress
 - Bi-Partisan Support
- State of Idaho
- Tennessee Valley Authority

OPERATIONS

- UAMPS does not have operational nuclear experience
- Energy Northwest has a first option to be the operating agent for the CFPP
 - Energy Northwest currently operates the Columbia Nuclear Generating Station in Washington
 - Energy Northwest has partnered with NuScale to assess operational issues utilizing a NuScale simulator in Richland, Washington

COSTS

- Levelized Cost of Energy (LCOE)
 - Average cost of energy for 40 years
 - No higher than \$65/MWh (2017\$)
 - Projected Price Range \$45-65/MWh (2017\$)

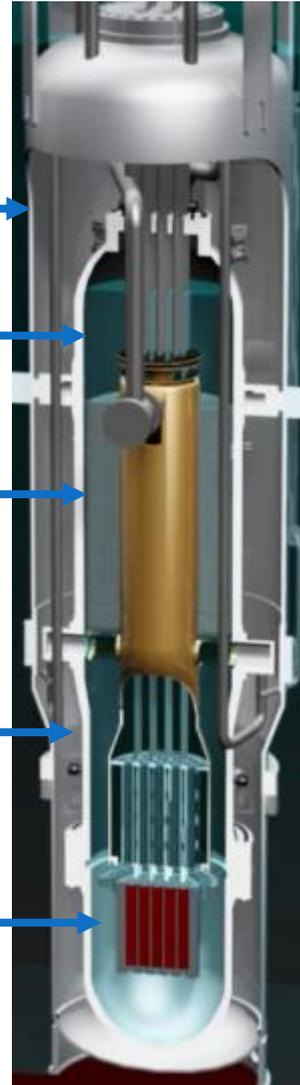
What is a NuScale Power Module?

- A NuScale Power Module (NPM) includes the **reactor vessel, steam generators, pressurizer** and **containment** in an integral package that eliminates reactor coolant pumps and large bore piping (no LB-LOCA)
- Each NPM is 50 MWe and factory built for easy transport and installation
- Each NPM has its own skid-mounted steam turbine-generator and condenser
- Each NPM is installed below-grade in a seismically robust, steel-lined, concrete pool
- NPMs can be incrementally added to match load growth - up to 12 NPMs for 600 MWe gross (~570 net) total output
 - ***Recent announced June 2018 up to 720 MWe gross***



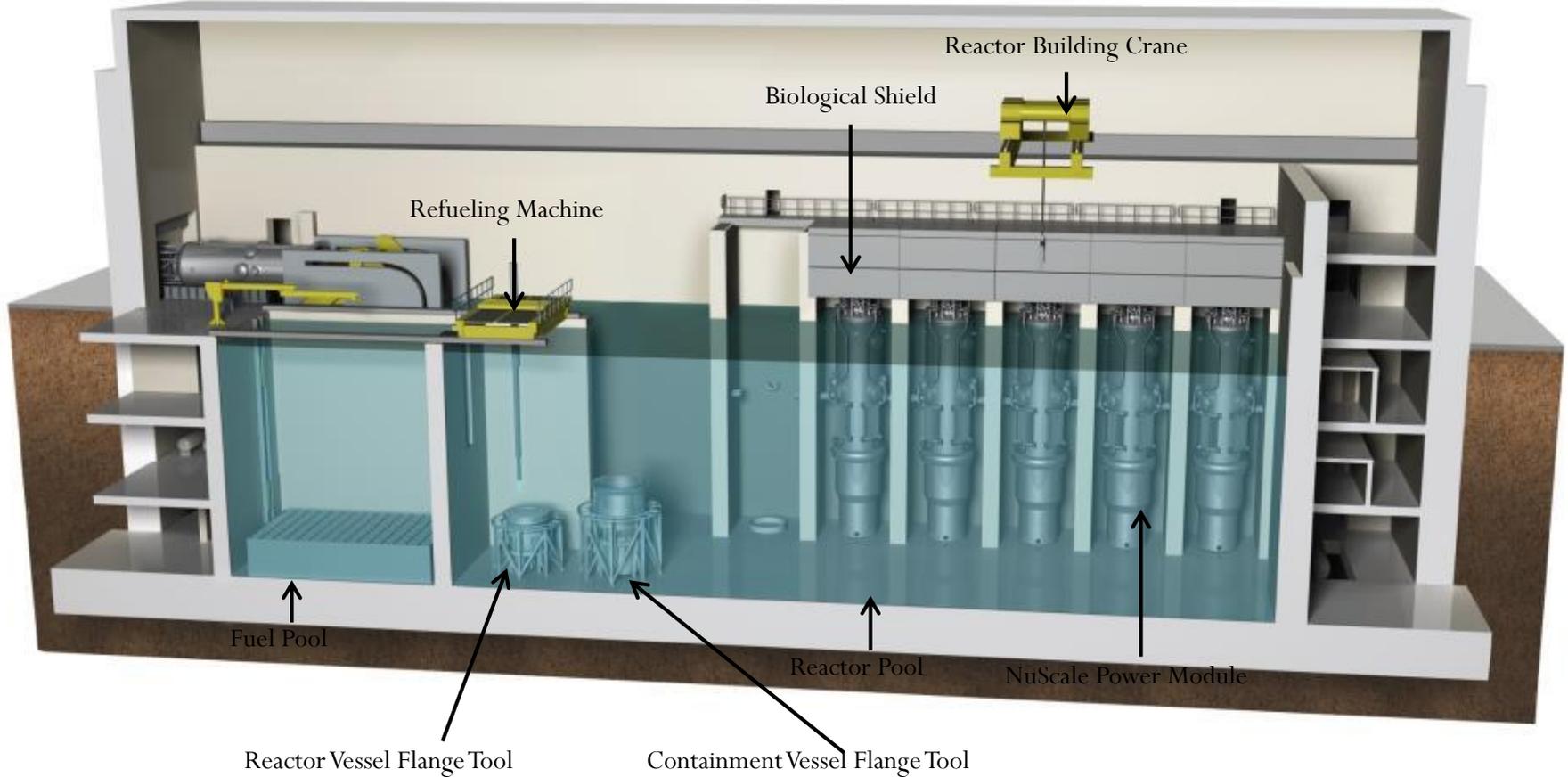
NuScale Small Modular Reactor

- Containment →
- Pressurizer →
- Steam Generators →
- Reactor Pressure Vessel (RPV) →
- Reactor Core →



Reactor Building Cross Section

Reactor Building houses NuScale Power Modules, Fuel Pool, and Reactor Pool



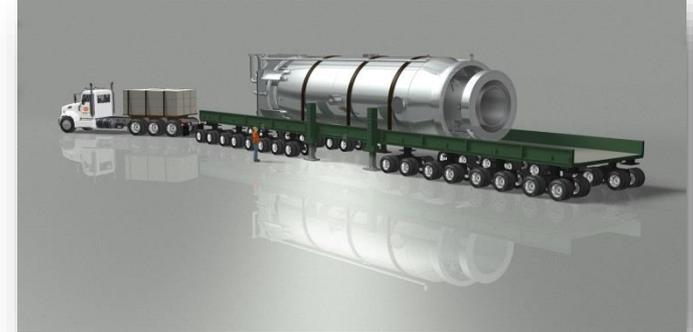
Site Layout



Next Generation of Nuclear

Simple

- Factory-built, integral nuclear steam supply and containment
- Fewer systems to construct and maintain



Safe

- Unlimited coping period for “Fukushima-like” events
- Core Damage once every 300,000,000 reactor years
- Site Boundary Emergency Planning Zone



Economic

- Competitive with Natural Gas Combined Cycle
- Integrable with variable renewable energy sources
- Flexible, add 60MW modules as needed

CFPP PROJECT LOCATION

IDAHO NATIONAL LABORATORY SITE



View of Site – Closest Highway Approach

(On Hwy 26 approaching junction with Hwy 20,
viewing elevation of ~ 100')



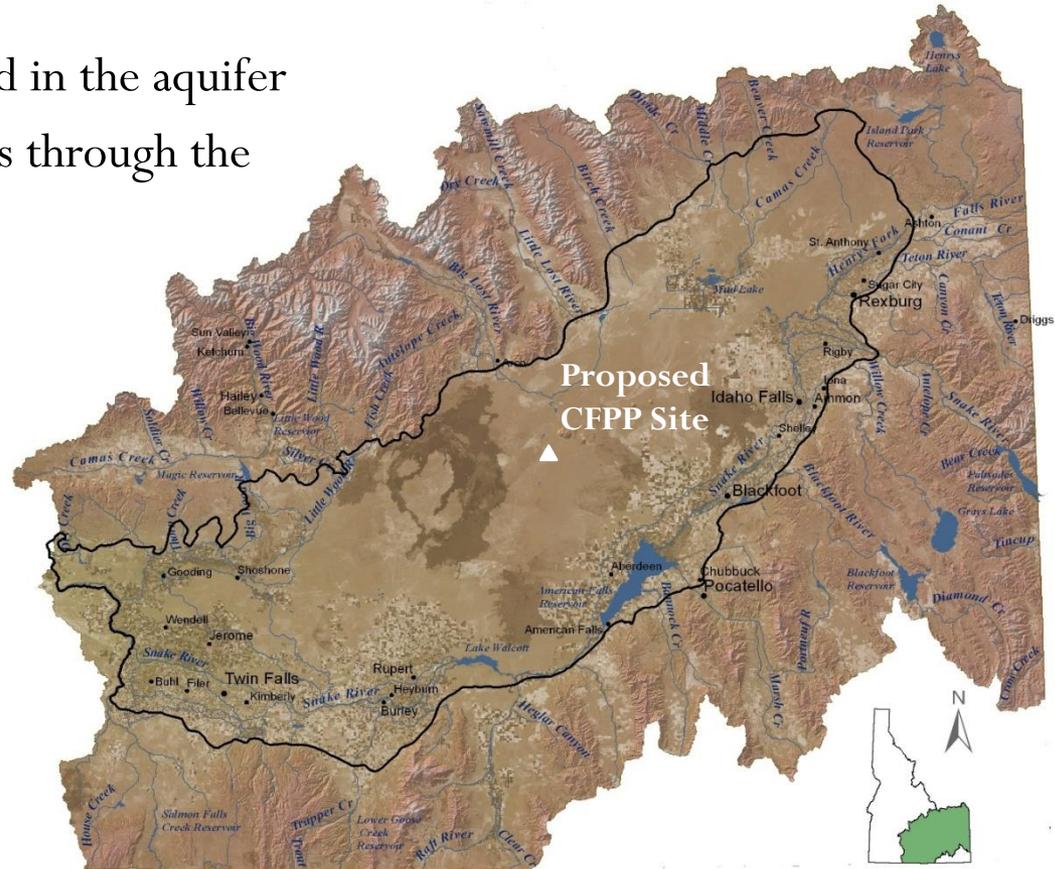
Looking Southwest

NRC LICENSING—NEXT STEPS

- Compiling a combined construction and operating license application (COLA) for the preferred site
- Anticipated to be submitted to NRC in the summer of 2020
- UAMPS will conduct pre-engagement submittal with the NRC

PROPOSED WATER SOURCE EASTERN SNAKE PLAIN AQUIFER (ESPA)

- 200 miles x 60 miles
- 1 billion acre-feet stored in the aquifer
- 8 million acre-feet flows through the aquifer each year



Eastern Snake Plain Aquifer Boundary

0 20 40 60 Miles

DEVELOPMENT WORK TO DATE SUMMARY

- No fatal flaws have been identified
- Continued development work will continue in a phased approach to minimize the cost of developing the CFPP as a resource option
- Objective=Increase cost certainty before submitting COLA and further de-risk permitting risk by continued development work

COST CONTAINMENT—MITIGATING RISK TO UAMPS PARTICIPANTS

- Phased development approach with monetary caps that can be spent during a particular phase
- Each Participant has a unilateral right to exit the project at the end of each phase
- Cost estimates will be revised at the end of each phase and budget will be approved before proceeding to the next phase
- Final right to exit the project will be at decision to proceed to construction (2023)

PHASED DEVELOPMENT APPROACH

- Phased development approach
 - Budget monetary caps for each phase
- Cost estimates will be revised at the end of each phase
- Each Participant has a unilateral right to exit the project at the end of each phase
- Budgets for each phase will be approved by the PMC before proceeding to the next phase
 - If budget exceeds cap then a Participant may withdraw
- Final right to exit the project will be at PMC decision to proceed to construction (2023)

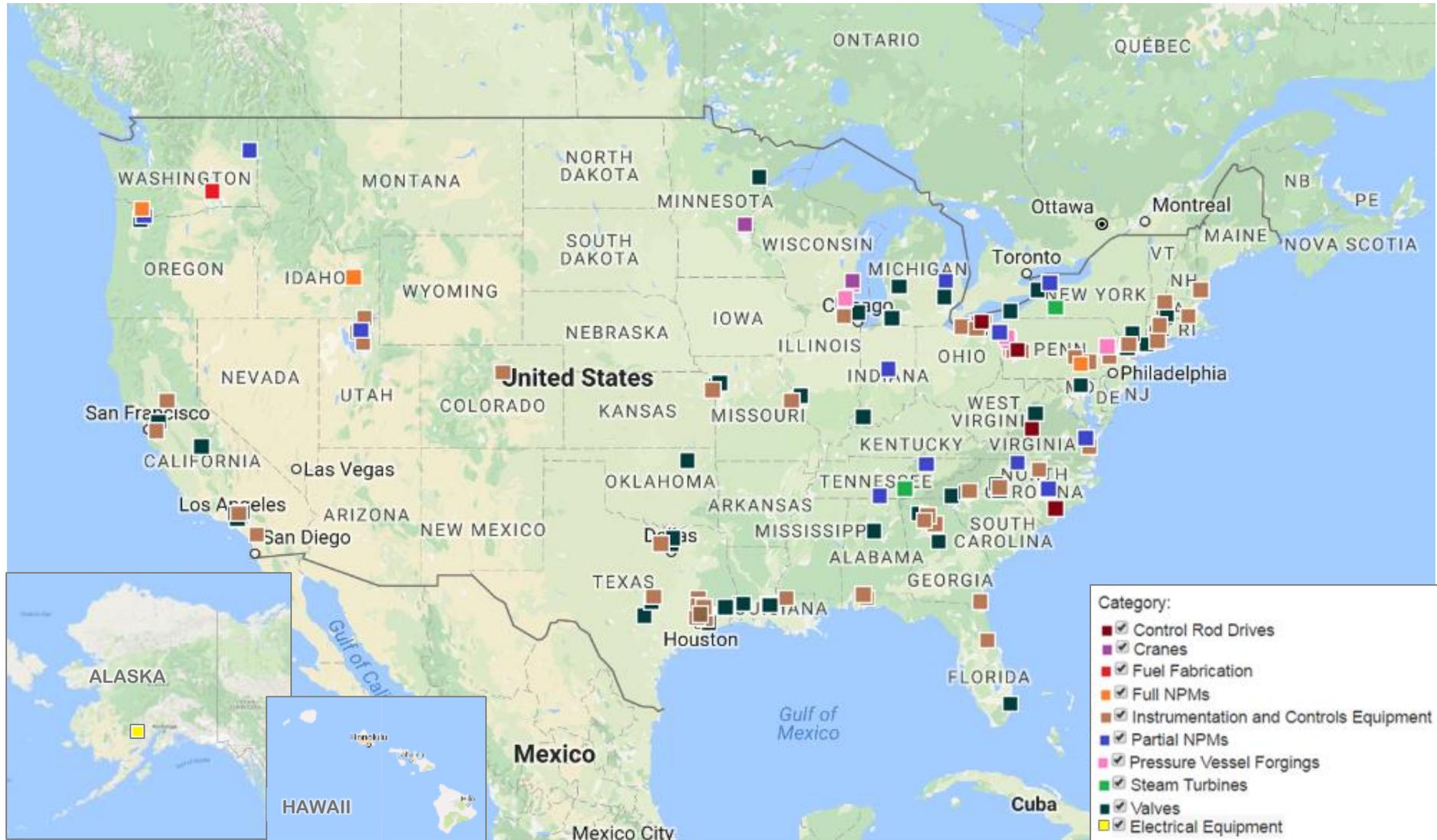
USG SUPPORT YIELDS JOB CREATION

- USG Investment in SMR Commercialization and Deployment Yields Significant and Sustained Domestic Jobs in Manufacturing, Plant Construction, and Plant Operations
- Manufacturing
 - Nearly 12,000 jobs in domestic supply chain for manufacturing 3 plants (36 modules) per year
- Deployment
 - Opportunity to re-power aging coal plants, re-train workers, keep jobs
 - Each NuScale Plant creates ~1200 jobs during peak construction
 - Each NuScale Plant employs 360 people during operation

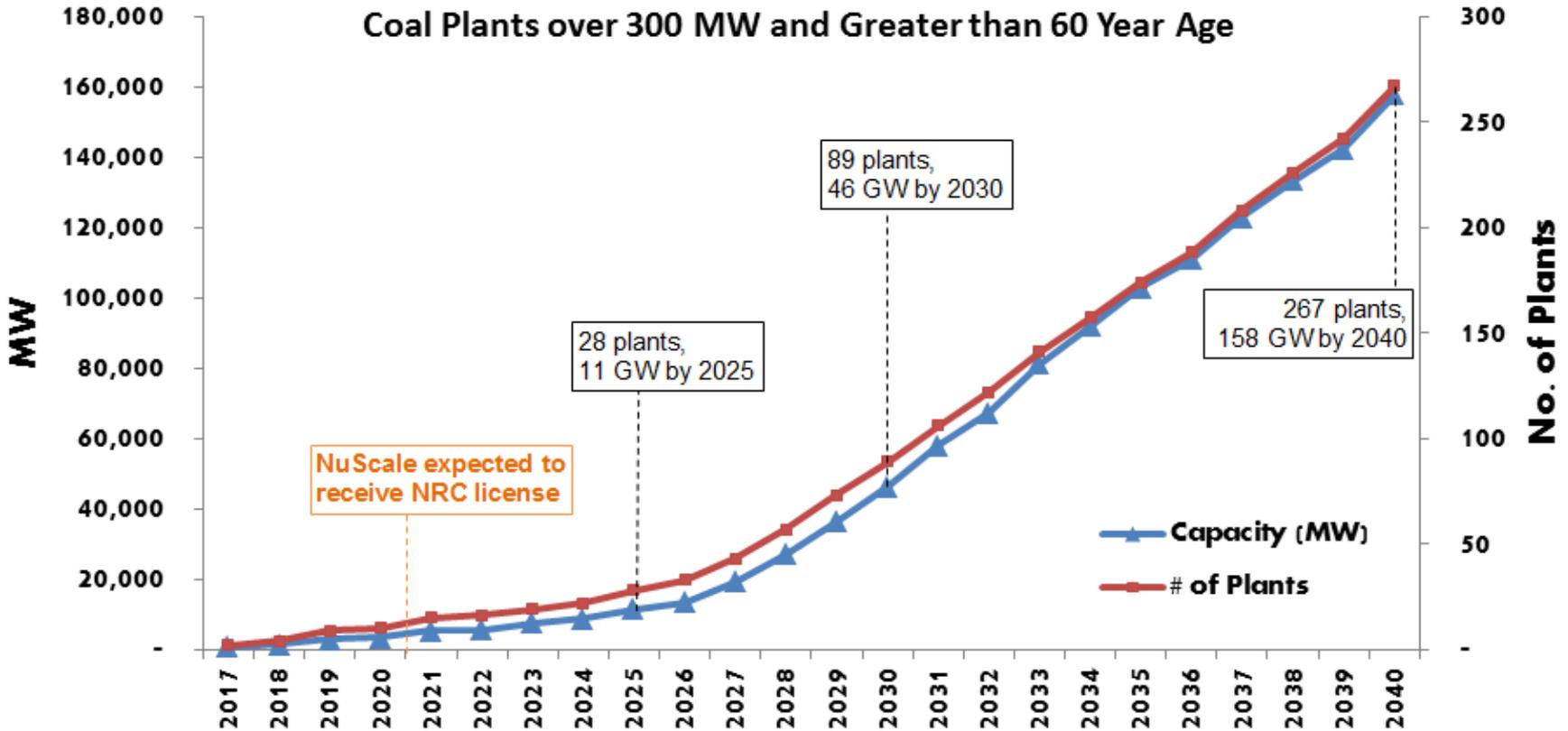
MANUFACTURING

Manufacturing Jobs @ 3 Plants per year	11,788
Instrumentation and controls equipment	2,254
Electrical equipment	2,088
Mechanical equipment	1,630
Valves	1,186
Civil Material/Steel/Architectural	1,050
NuScale Power Modules	1,000
Wire, Cable tray and conduit	780
Steam Turbines	710
Piping	666
Control Rod Drives	204
Pressure Vessel Forgings	120
Nuclear Cranes	71
Fuel Fabrication	29

POTENTIAL MANUFACTURING LOCATIONS



COAL PLANT RE-POWERING

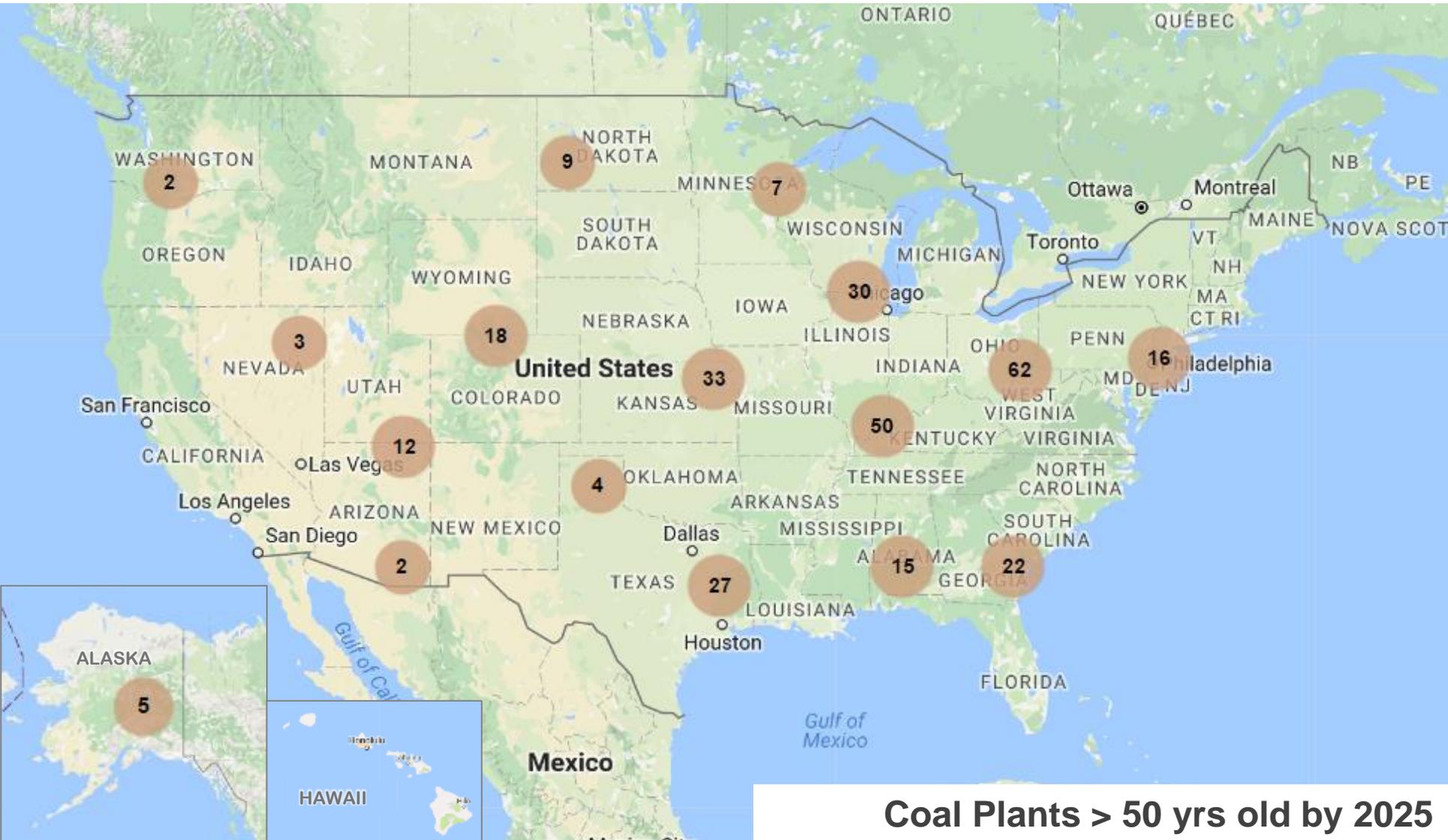


- Each NuScale Plant employs 360 people full-time, with 1200 peak construction jobs
- Domestic supply chain for manufacturing 36 modules per year generates about 12,000 jobs

CONSTRUCTION

Construction Jobs per 600 MW Plant	1,171
Carpenter, heavy equipment operator, laborer, welders	388
Electricians	182
Pipefitters, plumbers	90
Painters, insulators, laborers	89
Electrical Technicians	76
Ironworkers, welders	53
Mason, sheet metal workers, plasterer	51
Home Office: Engineers, Project Management, Supply Chain, QA, Security, HR	242

POTENTIAL SMR LOCATIONS



Coal Plants > 50 yrs old by 2025

OPERATION

Plant Staffing for Typical Baseload Power Plants

	Coal	Natural Gas Combined Cycle	NuScale Power Plant
Plant Employees (per 600 MWe)	146	24	365
Average Annual Wage for Staff	\$71,800	\$75,130	\$89,940

Jobs by educational requirement at 600 MW NuScale Power Plant

- Associates Degree, Vocation, or Military 170
- High School Diploma 110
- BS Engineering 85

➤ *Opportunity to train current coal plant workers to work at NuScale plant*

Sources: Utah Associated Municipal Power Systems (UAMPS); NuScale Power; Occupational Employment and Wages, May 2015, Bureau of Labor Statistics

Questions